TWO NEW LICHENS: *CLADONIA PAEMINOSA* AND *C. HUMILIS* VAR. *BOURGEANICA*

by

ALAN W. ARCHER*

ABSTRACT

Archer, Alan W. Two new lichens: *Cladonia paeminosa* and *C. humilis* var. *bourgeanica*. *Muelleria* (1): 1–5 (1989). — *Cladonia paeminosa* A. W. Archer and *Cladonia humilis* (With.) Laundon var. *bourgeanica* A. W. Archer are described as new. Both taxa contain fumarprotocetraric and bourgeanic acids and occur in Australia. *C. humilis* var. *bourgeanica* also occurs in Europe and North and South America.

INTRODUCTION

A recent examination of undetermined specimens in the lichen genus *Cladonia* (Ascomycetes, Lecanorales) in Herbarium collections from South Australia (AD) and Tasmania (HO) revealed specimens that were not referrable to any known taxa; similar specimens had been collected by the author in Victoria, New South Wales and the Australian Capital Territory. These specimens which resemble *Cladonia scabriuscula* (Del. in Duby) Nyl. and contain fumarprotocetraric and bourgeanic acids are here described as a new species.

A recent typification (Laundon 1984) of the lichens described by William Withering in the eighteenth century showed that the name *Cladonia conista* C. Robb. ex Allen was illegitimate as the epithet *conista* belonged to the synonymy of *Cladonia humilis* (With.) Laundon. The name '*C. conista*' has referred to a sorediate, scyphose taxon containing fumarprotocetraric and bourgeanic acids which Laundon (*loc. cit.*) referred to as an undescribed variety of *Cladonia humilis*. This variety is here formally named and described.

METHOD

The lichen compounds present in the specimens examined were identified by thin-layer chromatography of acetone extracts, using the mobile phases described by Culberson (Culberson 1972) and the separated compounds were detected with sulphuric acid (Culberson 1972) and MBTH (Archer 1978). The presence of bourgeanic acid (substance H) was confirmed with the micro-crystal test described by Thomson (Thomson 1967) and by mass spectrometry (*cf.* Bodo *et al.* 1973).

TAXONOMY

Cladonia paeminosa A. W. Archer, sp. nov.

Sicut *Cladonia scabriuscula* sed podetiis subsimplicibus, basibus podetiorum ecorticatis et acidum bourgeanicum continens.

Primary squamules small, inconspicuous, persistent, 1×2 mm, subdigitately lobed, margins smooth, green above, white below. *Podetia* arising from the squamules, 15–50(–100) mm tall, 0·5–1·5 mm diam., escyphose, simple or dichotomously branched, axils open, tapering towards the apices, the apices simple or bifurcating, subulate or with terminal pycnidia; ecorticate, or corticate at the base and becoming ecorticate, with tiny corticate patches scattered along the podetia, minutely squamulose, esorediate. *Apothecia* pale brown, terminal, convex, (0·2–) 0·5–1·0 mm diam. *Ascospores* eight per ascus, colourless, simple, ellipsoid, 12–14 μm long, 3–4 μm

*Division of Analytical Laboratories, Department of Health, P.O. Box 162, Lidcombe, New South Wales, Australia 2141.

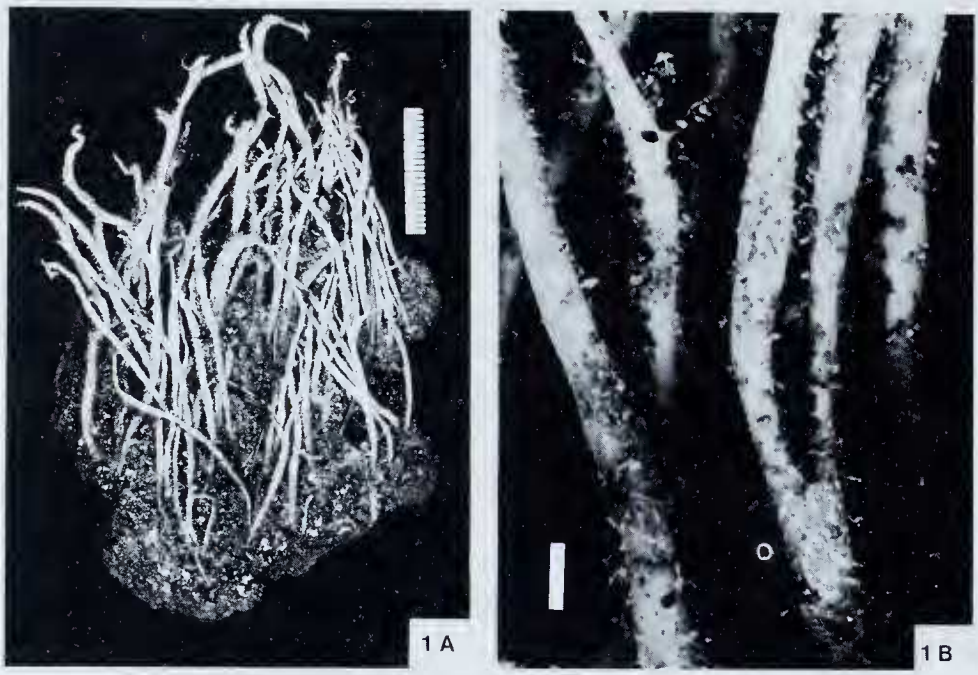

Fig. 1a. *Cladonia paeminosa.* Holotype. Scale in millimetres.

Fig. 1b. *Cladonia paeminosa.* Holotype. Close-up of podetia. Bar = 1 millimetre.

wide. *Pycnidia* terminal, black, subconical, 0·3 mm × 0·3 mm; conidia not seen. *Thallus* K−, KC−, Pd+ red; containing fumarprotocetraric and bourgeanic acids (Figs 1–2).

TYPUS: Australia, Victoria, near Mirimbah, by side of Mt Stirling Road, *c.* 30 km E. of Mansfield, 146° 25′ E., 37° 07′ S., alt. *c.* 700 m, 9.xi.1986, *A. Archer 2027* (HOLOTYPUS: MEL 1050876. ISOTYPI: ANUC, CBG, H, NSW).

FURTHER SPECIMENS EXAMINED:

South Australia — 14 km SE. of Mt Burr Township, 7.ix.1966, *I.B. Wilson 516* (AD 9255); Marshes Swamp, 24.vii.1980, *N. Donner 6997* (AD 4862); *ibidem*, 23.x.1982, *N. Donner 9577* (AD 9235).

New South Wales — 4 km S. of Termeil, 7.iii.1970, *E. Dahl* (CANB 227416); Black Flat, Currowan State Forest, 15 km NW. of Batemans Bay, 150° 04′ E., 35° 36′ S., alt. *c.* 200 m, 28.v.1983, *A. Archer 2113* (NSW).

Australian Capital Territory — Fishing Gap Trail, 33 km SW. of Canberra, 148° 52′ E., 36° 29′ S., alt. 900 m, 1.iv.1983, *A. Archer 2098* (MEL 1050870, NSW).

Victoria — on earth near sea, Mentone, 15.v.1886, *F.R.M. Wilson* (NSW); on mossy earth, Cunningham, iii.1890, *F.R.M. Wilson* (NSW); Narbethong, Healesville, viii.1906, *Mrs Goodyear* (NSW); by side of Howqua River, near Sheepyard Flat, *c.* 30 km SE. of Mansfield, 146° 20′ E., 37° 12′ S., alt. *c.* 500 m, 3.ix.1986, *A. Archer 2069* (MEL 1050874, NSW).

Tasmania — St Mary's Pass, *G. Bratt 73/646* (HO 54009); Prosser River Gorge, *J. Gilbert, s.n.* (HO 60742); Drip Falls, *M. Westbrook, s.n.* (HO 50617).

DISCUSSION

The specific epithet '*paeminosa*' refers to the rough surface of the podetia. *C. paeminosa* (Fig. 1a) is morphologically similar to *C. scabriuscula* (Del. in Duby) Nyl. but differs from that species in often lacking a well-defined corticate area at the base and on the lower part of the podetia. *C. paeminosa* has small irregular corticate patches along the podetia (Fig. 1b) and contains the aliphatic acid bourgeanic acid which is lacking in *C. scabriuscula*. Both species contain the depsidone fumarprotocetraric acid. *C. scabriuscula* has been reported to contain the depside atranorin (Culberson

Fig. 2. *Cladonia humilis* var. *bourgeanica*. Holotype. Scale in millimetres.

1970) or the triterpene ursolic acid (Thomson 1968), in addition to fumarprotocetraric acid. Specimens with atranorin are common in Chile (Ahti & Kashiwadani 1984) but only one Australian specimen (AD 4868) was found with atranorin. Ursolic acid was not found in any of the Australian specimens of *C. scabriuscula* examined. *C. scabriuscula* often occurs in large clumps with the much branched podetia dying at the base; in contrast, *C. paeminosa* is much less branched and often remains attached to the primary thallus on the soil on which it grows. Apothecia were seen in only one specimen of *C. paeminosa*, from South Australia. *C. scabriuscula* is a cosmopolitan species, widely distributed in Australia and occurs in all states whereas *C. paeminosa* is so far known only from south-eastern Australia and Tasmania. *C. paeminosa* belongs to the group *Cladonia* sub-group *Furcatae* in the recently proposed subgeneric classification of the genus *Cladonia* (Huovinen & Ahti 1982).

Cladonia humilis (With.) Laundon var. **bourgeanica** A. W. Archer, var. nov.
Cladonia conista auct.

Sicut *Cladonia humilis* var. *humilis* sed acidum bourgeanicum continens vice atranorinum.

Primary squamules persistent, conspicuous, 1–2 mm × 1–5 mm, rounded, lobed, margins slightly crenate, green above, white below, esorediate. *Podetia* growing from the upper surface of the primary squamules, simple, scyphose, lacking marginal or central proliferations, 5–20 mm tall, scyphi 3–6 mm diam., the podetial stalk corticate, the cortex areolate at the base, becoming sub-verrucose, rarely minutely squamulose at the base; the scyphi ecorticate and farinose sorediate, the interior

closed, ecorticate and farinose sorediate, margins entire or minutely denticulate, becoming slightly revolute in older specimens. *Apothecia* and *pycnidia* not seen. Thallus K−, KC−, Pd+ red; containing fumarprotocetraric and bourgeanic acids.

TYPUS: Australia, New South Wales, Six Foot Track, Binomea Ridge, 2 km N. of Jenolan Caves, 150° 02′ E., 33° 48′ S., alt. 1100 m, 13.iii.1987, *A. Archer 2086*. HOLOTYPUS: MEL 1050873; ISOTYPUS: NSW.

FURTHER SPECIMENS EXAMINED:

Australian Capital Territory — Kambah Pool, 28.vi.1970, *E. Dahl* (CANB 227965); near Honeysuckle Creek, 20 km SSW. of Canberra, 148° 58′ E., 35° 35′ S., alt. 1100 m, 2.iv.1983, *A. Archer 2097* (NSW); by side of Two Sticks Rd, 35 km W. of Canberra, 148° 48′ E., 35° 19′ S., alt. 1100 m, 30.x.1985, *A. Archer 1822A* (NSW); near Tidbinbilla River, *c.* 27 km SW. of Canberra, 148° 55′ E., 35° 28′ S., alt. 900 m, 21.iv.1986, *A. Archer 1935* (NSW).

Victoria — by side of Mt Stirling Rd, Mirimbah, *c.* 30 km E. of Mansfield, 146° 25′ E., 37° 07′ S. alt. 700 m, 5.xi.1986, *A. Archer 2005* (H, MEL 1050879); *ibidem* 9.xi.1986, *A. Archer 2024* (MEL 1050878).

Tasmania — Table Mountain, *G.C. Bratt 72/930* (HO 53023); Finger Post Track, *A.M. Gray 36* (HO 69121); Mt Wellington, *D. Ratkowsky L129* (BM, NSW).

DISCUSSION:

The combination *Cladonia conista* (Ach.) C. Robb. ex Allen (Allen 1930) was based on *Cenomyce fimbriata* var. *conista* Ach.; a specimen collected by Flörke was chosen as lectotype (Ahti 1966). The basionym of the epithet was later reported (Ahti 1980) to be superfluous and hence illegitimate and the combination *C. conista* (Nyl.) C. Robb. ex Allen was proposed, based on *C. fimbriata* f. *conista* Nyl. This combination was rejected as the basionym was published without a description (Laundon 1984), thus leaving the bourgeanic acid containing variety of *C. humilis* lacking a valid name. The epithet '*bourgeanica*' is here proposed for this chemical variety.

C. humilis var. *bourgeanica* (Fig. 2) is distinguished chemically from var. *humilis* by the presence of the fatty acid bourgeanic acid in place of the depside atranorin. Both varieties are distinguished from the somewhat morphologically similar *C. fimbriata* (L.) Fries by the presence of bourgeanic acid or atranorin and the corticate podetial stalk, absent in *C. fimbriata*. Two specimens of *C. humilis*, containing both atranorin and bourgeanic acid with fumarprotocetraric acid, have been reported, one from Chile (Ahti & Kashiwadani 1984) and a second specimen from Argentina (T. Ahti, in litt., 1987).

C. humilis var. *bourgeanica* is a widely distributed taxon and occurs in Europe, North America and South America. In Australia it has been found only in south-eastern Australia and Tasmania, in contrast to var. *humilis* which occurs in all States except Queensland. *C. humilis* var. *bourgeanica* has also been reported, as *C. conista*, from New Zealand (Martin 1958); the specimen on which this report was based [Mt Cargill, Dunedin, Otago, *W. Martin 4414* (CHR 385665)] was found to contain only fumarprotocetraric acid and is identified as *C. chlorophaea* (Floerke ex Sommerf.) Sprengel.

C. humilis var. *bourgeanica* belongs to the infra-generic group *Cladonia* subgroup *C. grayi* and allies (Huovinen & Ahti 1982).

ACKNOWLEDGEMENTS

The author is grateful to Professor T. Ahti, Helsinki, for much helpful discussion and to the National Herbarium of New South Wales for arranging the loan of specimens, and acknowledgement is made to the Director, Division of Analytical Laboratories, for permission to publish this paper.

REFERENCES

Ahti, T. (1966). Correlation of the chemical and morphological characters in *Cladonia chlorophaea* and allied lichens. *Annls. bot. fenn.* 3: 380–390.

Ahti, T. (1980). Nomenclatural notes on *Cladonia* species. *Lichenologist* 12: 125–133.

Ahti, T. & Kashiwadani, H. (1984). The lichen genera *Cladia*, *Cladina* and *Cladonia* in southern Chile. *In* Inoue, H. (ed.), 'Studies on Cryptogams in Southern Chile' pp. 125–151. (Kenseisha Ltd: Tokyo.)
Allen, A. F. (1930). Cladoniae from the valley of the Cap Chat, Gaspe Peninsula. *Rhodora* 32: 91–114.
Archer, A. W. (1978). 3-Methyl-2-benzothiazolone hydrazone hydrochloride as a spray reagent for phenolic lichen compounds. *J. Chromatogr.* 152: 290–292.
Bodo, B., Hebrard, P., Mohlo, L. & Mohlo, D. (1973). Un nouvel acide aliphatique des lichens *Desmaziera evernioides et Ramalina bourgeanica. Tetrahedron Letters* 18: 1631–1634.
Culberson, C. F. (1970). 'Chemical and Botanical Guide to Lichen Products'. (University of North Carolina: Chapel Hill, N.C.)
Culberson, C. F. (1972). Improved conditions and new data for the identification of lichen products by a standardised thin-layer chromatographic method. *J. Chromatogr.* 72: 113–125.
Huovinen, K. & Ahti, T. (1982). Biosequential patterns for the formation of depsides, depsidones and dibenzofurans in the genus *Cladonia* (lichen forming ascomycetes). *Annls. bot. fenn.* 19: 225–234.
Laundon, J. R. (1984). The typification of Withering's neglected lichens. *Lichenologist* 16: 211–239.
Martin, W. (1958). The Cladoniaceae of New Zealand. *Trans. R. Soc. N.Z.* 85: 603–632.
Thomson, J. W. (1967). 'The Lichen Genus *Cladonia* in North America'. (University of Toronto: Toronto.)

Manuscript received 11th September 1987.